and the volunteer nuisance is scarcely known here even by name. I can therefore only repeat that it is a very risky enterprise for a young, inexperienced chemist to come to England without a definite engagement, as so often happens. The result, with very few exceptions, is disillusionment, and many get into most unfortunate positions through financial pressure. The outlook is somewhat better for a chemist who has had experience and practice in works. But even such will find it infinitely more difficult to find posts in England than it is either in Germany or Austria, and will do well to go to England only when offered a definite appointment. The thorough scientific training and business capacity of the German chemist is unreservedly recognised by all unprejudiced judges in contradistinction to that of his English colleague. In carrying on routine operations, the English chemist is doubtless as competent as the German chemist, even if he be not his superior, but in conducting and developing chemical industries on a scientific basis the latter is far in advance of the former.

"I need refer but briefly to the great chemical industries, as they are well enough known. Of these the first to be mentioned is the soda industry, including that of sulphuric acid and chlorine; furthermore, tar-distilling, dyeing, calico-printing, the manufacture of iron, steel, copper, tin, and antimony, glass-making, the utilisation of fatty matters, the Scotch paraffin industry, and the manufacture of bichromate. These industries, excepting glass-making, employ a considerable number of chemists, although, in proportion to their output, not nearly so many as the German works. This is especially the case in dye works, calico-printing works, and in those dealing with fatty matters, many of which carry on their manufacture without chemists, or only with the aid of very imperfectly trained chemists, as every one here regards himself as a full-blown chemist who, after a most elementary preliminary training, has attended a technical course during one, or at most, two years. At least 80 per cent. of the chemists engaged in the industries mentioned are Englishmen, the remainder being either Germans or Swiss. I have never met a French chemist here. With few exceptions the condition of these industries during recent years must be characterised as dull and even as bad in some cases; they therefore offer the chemist little prospect of employment, and foreign capital is certainly not to be invested in them with advantage. Only dye-works and those utilising fatty matters offer a prospect to the experienced chemist, as these are both distinctly capable of being improved in position. The helpless condition of the English aniline colour works is peculiar, these having been simply stifled by the German works, which have developed with such giant strides. The English works eke out a miserable existence, and altogether do not employ as many chemists as are to be found in a similar German works of the fifth or sixth rank. Fuchsine, soluble blue, chrysoidine, Bismarck brown, and the few naphthol colours unprotected by patents, are almost the only colours manufactured. Not a single dyestuff of importance is made by any English firm alone, as scientific laboratories such as are a matter of course in every German works exist here only in the most rudimentary form. Most of the chemists engaged in English aniline colour works are German (? ?), but the demand for chemists in these works is very small. The erection of such a works in England on the German model could only be achieved by the large German firms engaged in this industry; it is another question whether it would pay. But the manufacture of pigments—of mineral colours and lakes—is certainly capable of development here. It is true there are a number of such works, but these rarely employ a chemist, and still more rarely one who has had a thorough scientific training. Consequently, enormous quantities of lakes are imported, especially for printing oil-cloths and carpets, which might equally well be manufactured on the spot. The necessary capital would be not an inconsiderable one, and may be estimated at, at least, 150,000 marks. Competent chemists in this branch can probably count on easily finding employment here.

"The manufacture of fine chemicals, which at present are almost entirely imported from Germany and France, is certainly capable of considerable development here. Of these may be mentioned especially, tannin, tartar emetic, pyrogallol, oxalic acid, cyanide of potassium, and most of the almost innumerable chemicals and preparations which are made use of in trade, and which are either not made here at all, or in altogether insufficient quantity and of poor quality. With reference to such articles, in the case of which wages form a considerable item in the cost of production, it is to be borne in mind that English wages are on the average considerably higher than German."

THE EFFECTS OF LIGHT ON THE ELECTRICAL DISCHARGE.

WHILE engaged on his classical experiments Hertz noticed that the appearance of the discharge between the two terminals of the oscillator was greatly changed upon the spark gap being illuminated by the light coming from another spark. This change was not due to an electrical action of the sparks, for it was equally well produced by other sources of light, such as the electric arc and burning magnesium, while all effect immediately ceased on interposing a plate of glass. Since the time when the above observations were made many experimentalists have investigated this subject and have obtained rather divergent results. In most cases the source of light employed has been the electric arc formed between carbon rods, though, with a view to increase the proportion of ultra-violet rays emitted, Bichat and Blondlot used carbon rods with aluminium cores, while Righi used a zinc rod for one terminal. Other observers have used the spark of an induction coil passing between terminals of copper, zinc, or aluminium. While Hertz had only noticed that the illumination of the discharging knobs increased the facility with which sparks passed, Wiedemann, Ebert and Hallwachs found that it was only when the negative terminal was illuminated that this effect took place. More recent observations by Branly have led to this view being modified, for he finds that on illuminating a piece of zinc by the sparks of a large induction coil produced between aluminium terminals, if the source of light is sufficiently near to the plate, the loss of charge is nearly as rapid for a positive as for a negative charge. On increasing the distance between the spark and the charged plate, the decrease in the rate of loss of charge is much more rapid for positive than for negative charges, and thus at some distance from the source of light the negative charge is the only one which is appreciably affected. Hence radiation of certain kinds increases the rate at which a positively charged body loses its charge, just as in the case of a negative charge, but the rays which are active in the case of positive electricity are absorbed by even a small thickness of air, while those rays which are unabsorbed are still able to accelerate the discharge of a negatively charged body.

After having made a series of experiments in air at ordinary pressures, Stoletow on the one hand, and Righi on the other, have investigated the influence of pressure on the phenomenon, and have both found that the effect increases with a decrease of pressure, while Stoletow has shown that if the rarefaction is carried to the extreme limit there exists a pressure, after which the effect decreases as the pressure is further diminished.

An experiment of Bichat's seems to show that the loss

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of electricity is due to convection currents, and this view has been further strengthened by Righi, who placed a plate of ebonite covered with tin foil on its upper side above a brass plate on which some figure, such as a cross, had been traced with varnish so that the plate was protected at these points from the effect of the illumination, the active rays being absorbed by the varnish. The negative pole of an electric machine was connected to this plate, the positive pole being connected to the tin foil, and the light of an electric arc allowed to fall on the under plate for a few seconds. The plate of ebonite being removed and powdered over with a mixture of sulphur and red lead a yellow cross on a red background was obtained of the same size as the one traced on the brass plate. As the sulphur attaches itself to those parts of the plate which are positively, and the red lead to those which are negatively charged, it follows that the parts of the lower plate which were not protected by the varnish have lost some of their negative charge, which has been carried on to the ebonite plate, and that this displacement has followed the lines of force of the electric field between the plates, which are in this case perpendicular to the two plates. This conclusion is further strengthened by observing that, if the electrified particles which escape from the lower plate are prevented, by means of a screen, from reaching the ebonite, a shadow of the screen is obtained.

The explanation that this convection is caused by the molecules of gas which, after being in contact with the body, become charged and are repelled, is hardly satisfactory, and the experiments of MM. Lénard and Wolf seem to show that it is particles of dust which carry the charge, for they suspended an insulated plate of metal in a box filled with air which had been carefully freed from dust. A plate of quartz fixed in one side of this box allowed the light from an electric arc to fall on the metal plate, while a stream of some vapour could be introduced through a side tube. Under these circumstances the vapour was condensed on allowing the light to fall on the plate if it was uncharged or negatively charged, while if the plate was positively charged no condensation took place. As it is known that a given space can become supersaturated with vapour when no dust is present, but that the introduction of the least trace of dust causes an immediate condensation, it appears that when a body either uncharged or negatively charged is illuminated it gives off some dust, and that the loss of charge is due to this dust. Further particulars of the work which has been done in this subject are given in a paper by M. Blondin in *Électricité*, p. 313, 1893. W. W.

NEOLITHIC DISCOVERIES IN BELGIUM.

THE fact that in Belgium flint was in certain districts largely worked during Neolithic times, for the manufacture of hatchets and other implements, has long been well known. The mines in the chalk near Mons, from which the rough blocks of flint were procured by the ancient flint-workers, have frequently been described, and bear a close analogy with the old workings at Grimes' Graves, near Brandon, and with the pits near that place, still being sunk by the flint-knappers of the present day. The fields in the neighbourhood of Mons have their surface strewn with roughly-chipped hatchets, and in other districts the occurrence of worked flints has been not unfrequently noted. In a memoir, recently published in the *Bulletin de la Société d'Anthropologie de Bruxelles* (Tome xi. 1892–93), M. G. Cumont has placed on record his discovery of two important Neolithic stations at Verrewinckel and Rhode-Saint-Genêse, neither of which places is far from the main road from Brussels to Charleroi, while both lie at but a short distance from the field of Waterloo. The forest of Soignes extended in early times over the whole district, and though both stations are on promontories of high land, there are or were, in the neighbourhood of each, springs or ponds from which to obtain a supply of water and, possibly, of fish.

The principal of the two was that at Rhode-Saint-Genêse, whence, including flakes and scrapers, M. Cumont has obtained no less than 3591 worked flints, a few implements made of other kinds of stone being reckoned among them; while Verrewinckel is credited with 815 specimens. Of all the forms a good summary account is given, and characteristic examples are figured in five plates. A detailed map of the district is also given. That the manufacture was carried on at the stations is proved by the presence of upwards of 240 nuclei from which flakes have been dislodged; but few of these appear to have rivalled in size those of specimens near Mons. It is indeed suggested that the hatchets and larger implements were rough-hewn at Spiennes, and finished where they were found. That this was the case is further shown by the fact that some twenty *polissoirs* were collected by M. Cumont, who also regards the flint which forms the material of the implements as having been derived from Spiennes, Obourg, or the neighbourhood of Mons. Over a hundred arrow-heads figure in the lists, and some of these, as shown in the plates, exhibit skilful workmanship. A few quaternary or palæolithic implements from the same region have been described by M. Cumont in another paper. He is to be congratulated on the rich harvest that he has reaped by his labours, which have now extended over a period of eight years. J. E.

THE LATE SIR SAMUEL BAKER.

NOTHING impresses more vividly upon one the rapid unfolding of our knowledge of Africa than the fact that the pioneers who forced the first paths into the unknown interior have survived to see generation after generation of younger men, who followed in their footsteps, fall victims to the fatal fascination of that continent. Burton, Grant, and Oswell, the companion of Livingstone's earliest journeys, have died so recently that we realise with a feeling of sorrowful surprise that the last of the first great group of explorers has passed away in the person of Sir Samuel White Baker, on December 30, 1893.

He was born in London in 1821, and after his school education turned his attention to engineering, but his professional work never took so thorough a hold upon his mind as the love for travel and sport, which his private means fortunately enabled him to gratify to his heart's content. Baker first went to Ceylon for elephant shooting in 1845, and saw a great deal of the island in subsequent years. Two books resulted from this experience—"The Rifle and Hound in Ceylon," published in 1854, and "Eight Years' Wanderings in Ceylon," in 1855. The study which he made of the climate of the elevated part of Ceylon led him to establish a colony of English agriculturists, fully equipped with a stock of cattle and sheep, at Nowera Eliya, over 6,000 feet above the sea, which is now a noted health resort. On the death of his wife, in 1855, he went to the Crimea, and carried out some railway work subsequently on the Black Sea coast. In 1860 he married a Hungarian lady, who survives him, after being his devoted companion through the trying years of African adventures, and in the pleasanter wanderings of his later life.

In 1861 he went to Egypt, resolved to carry on an extensive scheme of exploration at his own expense. With this object he spent a year in Abyssinia, working out the complete hydrography of the Atbara and its tributaries, and then started from Khartum to follow up the White Nile itself. In February, 1863, he met Speke and Grant at Gondokoro, returning from their great journey to the

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